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ORDINARY GENERAL MEETING.*

PROFESSOR LIONEL S. BEALE, V.P., F.R.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

A paper on "Biblical Astronomy" was read by Lieut.-Colonel G. Mackinlay, late R.A.

BIBLICAL ASTRONOMY.

By Lieutenant-Colonel G. MACKINLAY (late R.A.).

THE present seems a good time to consider the subject of Biblical Astronomy, on account of the recent advances in

(1) Biblical Scholarship.
(2) Discoveries and decipherment of ancient inscriptions, etc.
(3) Astronomy.

Scholarship.—It must be remembered that the languages of the Bible are comparable to a tool used by the divine Author; those languages are foreign ones to us, and a mere literal translation cannot in every case give the full meaning. During a residence in Spain, I found that even a certain mastery of the Spanish language was not in itself sufficient to bring me into real contact with the people. I had also to study the Spanish character and the Spanish attitude of mind. The difficulty of rendering the exact meaning intended by the writers of the Bible, with their ancient Eastern methods of expression, is certainly greater than that which exists at the present moment in translating a modern European book into English.

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* Monday, 20th February, 1905.

As Max Müller puts it, "when first we begin to learn a new language it seems easy . . . but the more we learn it, the more difficult do we find it to discover words which will really square with our own words."

As the divine scriptures are written for all nations and for all times, the main essential truths are plainly put forward; but when we come to seek for the full force of some of its sentences we thankfully accept the help afforded by careful scholarship.

Ancient Inscriptions, etc.—The fast accumulating translations of ancient inscriptions afford ample confirmation of the numerous Biblical allusions to the worship of the host of heaven.

Great assistance is given to ancient chronology; the account of a total eclipse recorded as seen at Nineveh 763 B.C. has been verified by calculation as having occurred at the date stated, when the band of totality passed about 100 miles North of the city. The eccentricities of the Egyptian Calendar, which moved its months through the seasons in a long cycle of some 1,565 years, have been helpful; as when it is stated that the Nile rose on a certain day of any one month, the date is necessarily fixed within a very few years.

Sir Norman Lockyer and others have shown that the dates of the construction of various Egyptian and Greek temples oriented to the risings of stars can be known within comparatively a few years, as the precession of the equinoxes (see Appendix) gradually rendered their central avenues of pillars quite unfitted for their astronomical purpose of allowing the rays of the rising star to enter and illumine the images in the central interior shrines, after a period which varied according to circumstances, but which may have averaged 300 years.

Even the statements of astrology giving the position of planets at the birth of a child afford chronological data; Professor Flinders Petrie thinks that the position of the planets indicated on certain ancient Egyptian diagrams show that the dates of birth of Rameses II. and Rameses VI. were respectively B.C. 1318 and 1198. We may, however, doubt the accuracy of the records in some cases, as a desire to please royalty may have tempted the artists to depict more favourable astrological arrangements of the planets than the true ones.

Contrast of Standpoints.—The appearance of the celestial orbs has little interest to most of us moderns, unless we are astronomers, surveyors, or sailors; we have no temptation to worship them, nor do we expect any control of our future by

their movements. Our climate prevents us from seeing them, especially when they are near the horizon, except at uncertain intervals; a large number of us live in towns lighted by gas and electricity, and thus the brilliancy of the stars is eclipsed. If we travel at night, we enter a well lighted railway carriage and we look outside it but little; we have good almanacks and clocks, and consequently most of us have no need to consult the celestial time-keepers, which regulate the earthly ones, and as our civil calendar has nothing to do with the moon, the variation in its appearance is not a matter of importance.

The modern astronomer is accustomed to refer his observations for accuracy to the vertical meridian. He believes most of the theories of the ancients were wrong, and consequently he generally bestows little thought on the efforts of man long ago to wrestle with the problems of the heavens, notwithstanding the fact that the length of the year, the correct arrangement of the calendar, and the direction of true north, were accurately known from the results of laborious observations some thousands of years ago.

But in Bible times how different was the standpoint. The heathen nations surrounding the Hebrews paid great attention to astronomy, and this is proved by the frequent, perhaps invariable, orientation of their temples to the rising or setting of the sun at a solstice, or at an equinox, or to the rising of some star. The study of astronomy was intimately connected with heathen worship. Professor Sayce tells us that the first known observatories in the world were those attached to Babylonian temples, which were generally dedicated to one of the heavenly host, or to some god connected with one of them by ancient myth. The priests were the observers, and under the authority of the king they regulated the calendar; they dabbled in astrology, doubtless for gain, and in order to keep up their power over the people. The Hebrew authors of the Scriptures, on the other hand, drew attention to the heavens in order to declare the glory of God, or to make some grand parallel to His grace and mercy. In Bible lands there is a bright clear atmosphere and a genial climate: there was little artificial light at night, and that only dim, and there was little hiding of the heavens during travel. The lunar month was employed by the Hebrews for their calendar, and consequently the position and appearance of the moon indicated the progress of the month. Almanacks and time-measuring instruments were few and rude, and hence the ancients generally must have frequently consulted the heavenly bodies for various purposes. Astro-

nomical observations were generally made on the visible horizon of risings and settings, although some, as at the Great Pyramid, were doubtless made on the vertical meridian.

The contrast between our modern western and the ancient eastern use of astronomy for practical purposes was brought to my notice in a very matter-of-fact sort of way some 30 years ago, when travelling with my wife by ordinary marches in the lower valleys towards Cashmere. We were in the habit of rising about an hour before daybreak, so as to be dressed and ready to start with the earliest streak of dawn, and thus avoid as much as possible the heat of the coming day. The native servants used to look at the positions of the stars during the night from time to time, until they judged that it was about an hour before daybreak, and as they did this from night to night they became very fairly accurate. They then called me, and I looked at my watch, and we got up at once or delayed a little according as their estimate had been fast or slow. One day a very long march down a hot valley was before us, and I was specially anxious to start in good time. Unfortunately my watch had stopped the day before, and it was the only timekeeper in all our little party. Before turning in at night I had a good look at the stars, and roughly estimated what their position should be at the time for our rising next morning. I got up during the night to look for myself, and then I found the heavens indicating, as I thought, about an hour before dawn; but not a move did I perceive among the servants and coolies, and when I woke them up they assured me that it was not yet time. However I insisted upon it that daybreak must soon come, so we rose, struck tents, packed up and drank the early coffee, but still no signs of morning! It was no use to wait, so off we started in the dark with a lantern; presently the path led into a dark wood, and then it skirted the edge of a hill with a precipitous fall on the left hand, which made it somewhat dangerous without daylight. Our progress was slow, and I began to realise that I had made a mistake, and that the Easterns who had been accustomed to judge of the time night after night from the position of the stars, were more to be trusted for practical purposes than the Western who attempted to do so for the first time after a single rough estimate the night before.

It is no uncommon thing for a servant in India to glance at the position of the sun in the heavens, and then make a very fair estimate of the time of day. Of course an Englishman could also do this if he practised this habit of observation, but our universal possession of watches and clocks hinders us from

seeking to attain this facility of telling the time direct from the heavens.

I was wondering the other day whether the intelligent modern would recur to the ancient methods of making direct use of the movements of the stars, when deprived of the ordinary clocks, etc., of present day civilisation. I therefore enquired of those who had been engaged in our late war in South Africa, and soon heard the following from an army nursing sister, Miss Watson Tulloh, R.R.C.

A young officer suffering from measles was a patient under her care at Norval's Pont in an isolation tent, and during convalescence he watched for her daily visits. As he had no clock or watch, he made use of the heavens, and he soon noticed that the nurse's last round, which was about a couple of hours after the winter sunset, was paid just when a bright star rose over a neighbouring kopje, and on the following evenings the same star again gave him due notice, though the length of warning increased a little each time. The incident would probably have been forgotten except for the facts which occurred afterwards: a false report of the officer's death, accompanied by a portrait, was published in the newspapers; a little later he was wounded in an engagement and brought back to the same hospital and to the same nurse. She recognised his features at once, but thought he must be some near relative of her former patient, and was only assured of his identity by his reminding her of the bright star rising behind the kopje!

We may conveniently divide our subject into the following sections:—

1. Jehovah, Creator and Ruler.
2. Worship of the heavenly bodies forbidden.
3. The Hebrew calendar.
4. Direction and orientation.
5. The heavens.
6. Grand astronomical statements.
7. Figurative allusions.

(1) Jehovah, Creator and Ruler.

In Gen. i, 1, we are told that God *created* the heaven, and afterwards in the sixteenth verse that He *made* or ordained the sun, moon and stars for their purposes. I do not stop to discuss how the current theories about the origin of the universe fit in

with the brief majestic statements in Scripture, but I would note that as we pass on through the Bible we find a very large number of similar statements of God's creative and ruling power made by various writers, with unerring consistency, right up to and through the times of the New Testament.

A few only are now quoted.

"Thou hast prepared the light and the sun" (Ps. lxxiv, 16; see also Ps. viii, 3, and lxxxix, 11); "Him that by understanding made the heavens" (Ps. cxxxvi, 5, 7; see also Prov. iii, 19); "Lift up your eyes on high, and behold who created these things" (Is. xl, 26; see also xlv, 18); "All things were made by Him" (John i, 3; see also Col. i, 16; and Heb. iii, 4).

Certain miraculous astronomical events are emphatically narrated in Scripture. The sun standing still (Josh. x, 12–14; Is. xxviii, 21; Hab. iii, 11). The shadow moving backward on the dial (II Kings xx, 10–11; Is. xxxviii, 8; II Chr. xxxii, 31). The star at Bethlehem (Matthew ii, 9). The failing of the light of the sun at the Crucifixion (Matt. xxvii, 45; Mark xv, 33; Luke xxiii, 44). These have been difficulties to many; but no one can deny that they are not in strictest accord with the repeated statements that God is ruler of the heavens.

The Bible records astronomical facts as they *appear* to an ordinary observer; no scientific astronomer can object to this, as he himself (using popular language) speaks of a "new moon,"* of the rising and setting of the heavenly bodies; and even in his own technical arrangements, a star is said to "cross the wires" in the field of view of the transit instrument. Whatever explanation we give of the extraordinary events narrated in the Bible, the fact remains that they are recorded as miraculous exhibitions of divine power.

The majestic titles of Maker and Lord of Heaven are often used in Scripture, specially by believers in Jehovah when they addressed the heathen; the hearers could understand something of the glory indicated by those names, though they were ignorant of His spiritual attributes of righteousness and mercy.

Thus we find both Melchizedec and Abraham, in the presence of the king of Sodom, speaking of God as "the Possessor" or

* A lady friend beginning to take an interest in astronomy was once talking to me about the *new* moon, and said she often wondered what became of the old ones! If the conventional language of prosaic English needs some care in order to understand it, can we wonder if Eastern expressions are not always to be taken quite literally?

"Maker of heaven and earth" (Gen. xiv, 19, 22). The heathen governor under Darius reported to him that the Jewish elders stated that they were "servants of the God of heaven and earth" (Ezra v, 11), and Darius uses the same title of Jehovah in his letter of reply (Ez. vi, 9). Artaxerxes also addresses Ezra as "the Scribe of the Law of the God of heaven" (Ez. vii, 12 and 23). Jer. x, 11, is in Aramaic, probably that it might serve as a special message to the Chaldeans: "Thus shall ye say unto them, the gods that have not made the heavens and the earth, these shall perish"; and then in Hebrew the prophet states to the Jews that the Lord "stretched out the heavens." Daniel uses the titles "God of Heaven" before Nebuchadnezzar (Dan. ii, 44), and "Lord of Heaven" before Belshazzar (Dan. v, 23). Jonah names Him "God of Heaven" (Jonah i, 9) before the heathen sailors; and in the New Testament, Paul and Barnabas at Lystra speak of the "living God who made the heaven and the earth" (Acts xiv, 15), and again at Athens, Paul spoke of Him before the Greeks as "the Lord of heaven and earth" (Acts xvii, 24, R.V.).

The majestic Psalms of the day (xix) and of the night (viii) each begin by demonstrating the glory given to Jehovah by His vast works in the universe; the former announces that "the heavens declare the glory of God," while the latter addresses Him, who has set His "glory above the heavens."

In some places God's great work of creation is linked with His great work of atonement and redemption, as in Ps. xix, 1 and 14, "The heavens declare the glory of God . . . O Lord my rock, and my redeemer"; and Col. i, 16 and 20, "In Him were all things created in the heavens . . . through Him to reconcile all things unto Himself, having made peace through the blood of His Cross"; see also Prov. viii, 23, 27, and ix, 1, 2, "I was set up from everlasting . . . when He established the heavens I was there . . . wisdom . . . . hath killed her beasts: she hath mingled her wine; she hath also furnished her table." Modern science can teach us nothing of the second of these great works, but the advances of astronomy have enlarged our knowledge of the vastness and grandeur of the universe, and consequently have taught us a fuller sense of the glory of the Maker and Ruler.

(2) Worship of the Heavenly Bodies Forbidden.

Every careful reader of the Old Testament must be struck by the fact that worship of the heavenly host was very preva-

lent among the nations surrounding the Israelites in Old Testament times. The attention of readers of the Revised Version is more markedly drawn to this fact by the use of the correct term "Sun images" in the text instead of "images" only for the Hebrew word "Chammanim" in the text of the Authorised Version (Lev. xxvi, 30, Is. xvii, 8, etc.). A little further search into the meanings of some proper names (*e.g.*, Beth-shemesh, Potiphera, Tammuz, Ashteroth-Karnaim, Sennacherib, etc., of which the first three refer to the sun and the last two to the moon in different languages) show us that this form of false worship was very widespread indeed. Modern discoveries tell us the same thing, and numbers of temples have been found dedicated to one or other of the orbs of heaven; not only in Egypt, Assyria, Asia Minor and Greece, but as far west as our own country, in which we have Stonehenge, and as far east as China, where there are remains of ancient Sun temples. Emblems of the divinity in the form of solar discs with wings have been found in large numbers. (See fig. 1.) We thus find a close agreement between Scripture and the old monuments.

We find stern denunciations in the Bible of all false worship, particularly of that of the host of heaven, "Take heed . . . lest . . . when thou seest the sun . . . thou be drawn away and worship" (Deut. iv, 19). "Worshipped . . . the sun . . . which I have not commanded," (Deut. xvii, 3) "Manasseh . . . . built altars for all the host of heaven . . . wrought much evil in the sight of the Lord" (II Kings xxi, 5, 6). "If I beheld the sun when it shined, or the moon walking in brightness, and my heart hath been secretly enticed" (Job xxxi, 26, 27), and in the second commandment (Ex. xx, 4), the first forbidden image is that of anything in the heaven above.

In Ezek. viii, 16, we read of men who committed abomination "their faces towards the East and they worshipped the sun towards the East."

Sun worship still has many votaries among the Parsis; the Hindus also still worship the orb of day to a very large extent; and many remains of moon worship survive in the East both among Hindus and Mahommedans.

Max Müller tells us that the temples of Babylonia and Egypt were well provided with towers, for the double purpose of offering up sacrifices and for observation of the heavens. The temple at Jerusalem had no such towers; but we find at times when the Jews disobeyed the Lord they followed heathen

examples, worshipping the host of heaven on the tops of their own houses (II Kings xxiii, 12; Jer. xix, 13; Zep. i, 5).

Not only was the worship of the heavenly host interdicted, but a superstitious dread of any unusual appearance in the heavens was forbidden: "be not dismayed at the signs of heaven: for the nations are dismayed at them" (Jer. x, 2, R.V.).

The close connection between the false religions of the powerful nations on either side of the Holy Land and astronomy may have given a bad repute to the study of the heavens among the Hebrews themselves (Is. xlvii, 13); and we do not find it recorded that any of them excelled in this study, unless we except Moses, who was learned in all the wisdom of the Egyptians (Acts vii, 22), Solomon, whose wisdom "exceeded the wisdom of all the children of the East, and all the wisdom of Egypt" (I Kings iv, 30); and Daniel and his three companions, to whom God gave "knowledge and skill in all learning and wisdom" (Dan. i, 17). The mention of the wisdom of the Egyptians and of the children of the East in the first two of these instances, and the fact that Daniel and his companions gained this knowledge and skill in a foreign land, all point to the conclusion that science in general (including astronomy) was more studied in the great countries of Egypt and Chaldea than among the Israelites.

The Hebrew Calendar.

The Bible account of the origin of the Hebrew nation tells us that the founder Abraham came from Ur of the Chaldees, and that he was careful that his descendants should marry among his own relatives; his grandson Jacob also spent many years of his life in Mesopotamia, and he eventually migrated with all his descendants to Egypt, where they lived for some 215 years. We are further pointedly told that, although the children of Israel lived in Egypt so long, they were only there as "strangers" (Gen. xv, 13; Ex. xxiii, 9; Deut. x, 19; xxiii, 7), and they left it by divine command to seek out their own long promised land. Bearing these statements in mind, we should expect to find that the Hebrews more nearly followed the Babylonian than the Egyptian calendar (if we can trace what each was), notwithstanding their long sojourn in the land of the Pharaohs.

The ancient records fully confirm this expectation; we find from them that the Babylonians, who belonged to the Semitic race as well as the Hebrews, had a calendar in which the year was composed of twelve lunar months of 29 and 30 days,

with an additional month inserted about every third year to prevent them from moving through the seasons; this was also the arrangement of the Israelites, who, however, possessed their own peculiarities of calendar; for instance, at the beginning of their national life they simply indicated a month by its number, while the Babylonians assigned special names to each. They also had special feast times and sabbaths.

The Egyptians (a race quite foreign to the Israelites), on the other hand, had equal civil years of 365 days each, regulated by the sun alone, and divided into twelve non-lunar months of thirty days each, with a separate and added period of five days; while the Egyptian sacred year was corrected on much the same principle as that which we now adopt in our leap year arrangement.

In Babylonia much attention was given to the moon, witness the remains at the present moment of a temple to the moon god at Abraham's own town of Ur. Temples to the sun god are very numerous in Egypt, but those to the moon are rarer.

When the Hebrews lived in Egypt they must doubtless have used the Egyptian calendar, at any rate in their dealings with the inhabitants of the land, and possibly they used the Babylonian luni-solar calendar, or a similar one, among themselves as the Jews do now; but this is not very likely, as at first they were few in number, and they then had no great feasts of their own to observe. But from the time of the first passover they gave up the Egyptian calendar altogether, and the Lord's words to Moses, "This month" (evidently a strictly lunar one) "shall be unto you the beginning of months, it shall be the first month of the year unto you" (Ex. xii, 2), emphasizes the break with the land of the oppressors. This abandonment of the Egyptian calendar must have needed great skill and wisdom on the part of Moses to carry out,* and it was of a piece with the general policy to prevent any return to the land of Egypt, which was naturally in the

* The tenacity with which an old calendar may be clung to is shown by the fact that in two Mahommedan countries with strictly lunar years, Morocco and Persia, there are still remains of another calendar. In the former country, the time for sowing is regulated by almanacks in which the actual names of the Roman non-lunar months still survive (letter from G. Michell, Esq., H.B.M. Vice-Consul Casa Blanca, Morocco). And in Persia governors assume their offices on the first day of the year, which is computed according to the old Persian solar reckoning. (Letter, Rev. H. St. Clair Tisdall missionary in Persia.)

minds of some (Ex. xvi, 3; Numbers xiv, 4; Acts vii, 39). The beginning of an Israelitish month at the appearing of the new moon was announced by the blowing of trumpets* (Numbers x, 10).

Our present calendar is the outcome of the old Egyptian one, through Roman channels, several times altered, and not even now uniformly adhered to in Europe, as Russia has not yet adopted the last correction. The Hebrew calendar has lived on unchanged, and it also forms the basis for regulating our Easter and Whitsuntide.

The Sabbath.—Some say that as the four quarters of the moon (new, full, and the waxing and waning halves) are periods of definite change, that the week of seven days has its origin in being roughly the quarter of 29½ days, which is approximately the period of a lunation. But we must put aside this vague guess, in view of the positive scriptural statement that the Sabbath was instituted because "God rested the seventh day, wherefore the Lord blessed the seventh day, and hallowed it" (Ex. xx, 11), and we must conclude, in agreement with the author of the article on "Astronomy" in the *Encyclopedia Britannica*, that the origin of the Sabbath is divine.

It has been said that the Sabbath was borrowed from the Babylonians, since they always began the month with the new moon,—a day which was considered unlucky for some purposes,† and every succeeding seventh day in the month was likewise so distinguished; the fifteenth day being called "Sobat," a word which Dr. Pinches believes to be of ancient Accadian origin and meaning "rest of the heart" or "middle" (of the month). It is quite possible that the Babylonians may have retained *some* trace of the divinely appointed Sabbath, and the actual Hebrew word "Shabbath" may have been derived from the same ancient language. The Hebrew arrangement of strictly weekly Sabbaths was not the same as the Babylonian one of unlucky days, as new moon and sabbath did not always fall on the same day (II Kings iv, 23), and consequently, the 15th of the month, the Babylonian "Sobat," could only sometimes be a Hebrew Sabbath.

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* The Hindus blow trumpets on new moons. (Letter, Rev. A. Margöschis, Tinnevelly, S. India.)

† Hindus do not sow their fields or reap on new moon days and, in general, important work is not undertaken on those days. (Rev. A. Margöschis.)

Other traces of septiform arrangement are found among the ancient nations near the Israelites. Several of the constellations were considered to be composed of seven bright stars.* The Egyptians are not known to have had any plan of ordinary weeks of seven days; yet they celebrated a feast every thirty years, when the first day of the civil year (which was always 365 days) showed an increased difference of seven days from the sacred year, which was a corrected one; and we are told in Gen. l, 3, that the Egyptians mourned for Jacob seventy days.

But it is among the Hebrews that the prominence of the number seven (spiritually signifying rest or completeness) is most conspicuous.

The calendar of the three great annual feasts and also other periods is arranged on this plan, for instance—

The seventh day is the Sabbath (Ex. xx, 8, 9, 10).
The seventh week from the morrow of the Sabbath after the passover was the feast of weeks (Lev. xxiii. 16).
The seventh month from the passover was the feast of tabernacles (in-gathering) (Lev. xxiii, 34).
The seventh year was the year of release (Ex. xxiii, 11).
After seven times seven years was the year of Jubilee (Lev. xxv, 8, 9).
Seventy years was the period of the captivity (Jer. xxv, 11), and of the age of man (Ps. xc, 10).
Seventy weeks or seventy periods of seven years each was the period prophesied by Daniel (Dan. ix, 24).
And there may be other longer septiform periods.

Feasts.—With regard to the three great annual feasts of Jehovah mentioned above, viz., Passover, Weeks, and Tabernacles, it is interesting to notice the time of the year and of the month in which they were placed. The first and the last were in the middle of the month at the full moons near the equinoxes, and the intermediate feast was at about the beginning of May, when the moon was at or near the beginning of its second quarter. Thus on the first days of two of the feasts there would be the light of full moon all night, and at the other one, a fair amount of moonlight for the first part of the shortened night of early summer.

Thus a maximum amount of nocturnal illumination was obtained in the first days of the feasts, consistent with the

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* See p. 106, vol. ii, *Prim. Constellations*, by A. Brown.

carrying out of the septiform arrangement: this must have added to the splendours of the feasts, and it must have had a practical advantage in the avoidance of confusion,* as we remember that all the males were ordered to appear before the Lord on these three occasions (Ex. xxiii, 17). It is observable that there was no feast at Midsummer, when the great heathen orgies of Tammuz, and sun worship generally, were celebrated by the neighbouring heathen.

The feast of the Passover was the foundation day of Hebrew Deliverance (Ex. xii, 27), and Christ our Passover (I Cor. v, 7) also died on the same day (Mark xv, 42).

The feast of Weeks or first fruits was the day of the giving of the law† (Ex. xix, 1, 10, 11), and also of the descent of the Holy Spirit (Acts ii, 1, 2).

The great feature of the feast of Tabernacles was rejoicing (Lev. xxiii, 40; Deut. xvi, 15 R.V. "altogether joyful") at ingathering. When the Hebrew nation had reached the summit of its glory, Solomon's temple was dedicated on that day (I Kings viii, 2), and the people were sent away "joyful and glad of heart" (I Kings viii, 66). There is also to be a future glorious keeping of this same feast at Jerusalem (Zech. xiv, 16), and it is also typical of the future day of great joy in store for the Christian (I Pet. iv, 13).

Under some circumstances the Passover was allowed to be kept on the corresponding days of the second month, instead of the first (Num. ix, 10, 11; II Chr. xxx, 2); but Jeroboam was severely blamed for setting up a rival feast on the eighth month instead of the seventh, a date which "he had devised of his own heart" (I Kings xii, 32, 33).

In Ezekiel xlv, 21, 25, the feasts of Passover and Tabernacles are alluded to, but not that of Weeks; and generally there is more frequent mention of the first and last feasts than of the intermediate one. The prominence of two of the feasts over the other is expressed astronomically by their occurrence at the definite periods of the equinoctial full moons, while the other feast was at a time of no special astronomical importance. As the fronts of the tabernacle and of the temple faced to the

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* A volunteer friend tells me that another volunteer, who was in the habit of attending Easter manœuvres, and whose power of observation exceeded his information, once said to him, "How remarkable it is I always find a full moon for this outing! the moonlight at night is very convenient in camp life."

† See p. 48, *The Portable Commentary*, Rev. R. Jamieson, D.D.

East, the rising sun would be almost directly in front at two of the feasts, but not at the other.

The daily sacrifices were at sunrise (II Kings iii, 20, 22) and sunset. Noon was also a stated time of prayer for some (Ps. lv, 17).

An Ancient Calendar.—A year containing twelve months of thirty days each is alluded to in Gen. vii, 11, 24; viii, 3, 4, 13, as it was 150 days from the seventeenth day of the second month to the seventeenth day of the seventh month. There must have been twelve of these months, because a period of *at least* $40+7+7=54$ days elapsed between the first day of the tenth month of the first year, and the first day of the first month of the following one (see Gen. viii, 5, 6, 10, 11, 12). It is believed that there were not any additional intercalary days.

If the word "time" is taken to represent a year, and "times" two years; the periods "time, times and a half" (Dan. xii, 7), "forty and two months" (Rev. xi, 2), and "1260 days" (Rev. xi, 3, xii, 6) are identical, each representing three and a half of such years.

The so-called Egyptian "vague year" of 360 days was of the same construction; it is believed to have been in use till about 2,000 B.C., when the five epact days were added to each year. A similar year was probably known to the ancient Babylonians.

When the sun and moon are both used, as in the Hebrew Calendar, it becomes necessary to have some means of foretelling the vernal lunation which is to contain the passover, or what comes to the same thing, to determine beforehand which years shall contain an extra lunation: this led to a search for astronomical cycles, *i.e.*, periods when different celestial revolutions are performed in almost the same time. Meton, about B.C. 432, found, from the result of careful observations, that 235 lunations only exceed 19 years by about 2 hours 10 minutes; in other words, after a cycle of 19 years the new and full moons recurred on the same days of the year, and this happens again and again. This is a convenient cycle, the Jewish reckoning for the passover and our golden numbers in the Book of Common Prayer for finding Easter being founded upon it. It must be noted, however, that after eleven such cycles (209 years) have elapsed, that the $2\frac{1}{6}$ hour differences add together, and amount to 24 hours; consequently after every 209 years a correction of one day must be made.

De Cheseaux, a Swiss astronomer, who lived in the middle of the eighteenth century, was searching for other such cycles, and found that the number 1260 (Rev. xi, 3, and xii, 6), and also 2300 (Dan. viii, 14) gave excellent cycles when taken as *years*, each having a small error in the same direction. He therefore expected and found that their *difference* 1040 would be more correct still. In recent years Dr. Grattan Guinness has taken advantage of this cycle to construct tables giving the times directly of all new moons for a period of over 5,000 years; this has been certified, by competent astronomical authorities, to be in very close accord with the results of long and careful computations: for the practical purpose of chronology the two methods may be said to give identical results.

This cycle was apparently not understood by the writer Dan. viii, 15: it was only discovered by a comparison of Bible numbers.

The assumption that the 1260 and 2300 *days* in the text in the Bible, may be regarded as *years*, is based upon the two passages, Numb. xiv, 34, "searched out the land . . . each day for a year," and Ezek. iv, 6, "I have appointed each day for a year."

(4) Direction and Orientation.

The points of the Compass.—We have already noted that in Old Testament times observations were generally made of the risings of the sun and stars on the visible horizon; we can therefore readily understand why the East was regarded as the front; the West was consequently behind; the North was on the left; and the South on the right.* It may be assumed that when the words front or before, hinder, left, right, are used with respect to a fixed object such as a building, town or country, that East, West, North, South respectively are intended. Our versions do not always carry this out, as will be seen from the appended table, which refers to our own authorised and revised versions, and also to French and Spanish

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* The same arrangement is observable in Sanscrit and in some at least of the Indian languages (*e.g.*, Bengali and Marathi) derived from it. In modern Arabic the same rule also obtains, though in some places one or more of the terms have become obsolete and other expressions are now used instead.

Yemen in Arabia and the Deccan in India both owe their names to this arrangement, and both mean "the south country," literally "the right hand," in Arabic and in Sanscrit respectively.

To face page 137.

SOME BIBLICAL WORDS
FOR
THE FOUR QUARTERS OF HEAVEN. (Jer. xlix, 36.)

	Hebrew word.	Ordinary meaning.	Translated in texts A.V.	Texts.	References. A.V. Text.	A.V. Marg.	R.V. Text.	R.V. Marg.	French (D'Ostervald).	Spanish (Cip. de Valera).
East.	Qadmoni...	What is before...	east	Ez. x, 19; xi, 1; xlvii, 18	*	...	*	...	*	*
			former	Joel ii, 20						
				Zech. xiv, 8	l.	*	*	...	*	*
	Qedem ...	Ditto ...	forward... ...	Job xxiii, 8	l.	...	l.	...	*	*
			before	Is. ix, 12	l.	...	l.	*	l.	*
West.	Acharon ...	behind, last	Uttermost	Deut. xi, 24; xxxiv, 2 ...	l.	...	l.	*	*	l.
			utmost ...							
			hinder ...	Joel ii, 20; Zech. xiv, 8 ...	l.	...	*	...	*	*
	Achor ...	backward, etc.	Backward	Job xxiii, 8	l.	...	l.	...	*	*
			behind ...	Is. ix, 12	l.	...	l.	*	l.	*
	Yam ...	sea (in 305 texts)	West	In 69 texts	...	...	...	...	...	...
South.	Negeb ...	District S. part of Judea.	South in 111 texts.	Gen. xiii, 1	*	...	*	...	*	*
	Yamin ...	R. hand or R. side.	R. hand or R. side, South	I Sam. xxiii, 19	*	l.	*	...	*	l.
				I Sam. xxiii, 24	*	...	*	...	*	l.
				II Sam. xxiv, 5 ...						
				I Kings vii, 39, 49 ...	l.	...	l.	...	l.	l.
				II Kings xxiii, 13 ...						
				II Chr. iii, 17; iv, 6, 7, 8						
				Job xxiii, 9	l.	...	l.	...	*	*
				Ps. lxxxix, 12	*	...	*	...	*	*
	Yemani ...	Ditto	Ditto ...	I Kings vi, 8; vii, 21, 39						
				II Kings xi, 11 ...						
				II Chr. iii, 17; iv, 10; xxiii, 10	l.	...	l.	...	l.	l.
				Ez. xlvii, 1, 2 ...						
	Cheder	Chamber (in 17 texts.)	South	Job xxxvii, 9	*	l.	Text R.V. "Chamber *of the South.*"		*	*
	Midbar ...	Wilderness etc. (in 253 texts).	South	Ps. lxxv, 6	*	l.	*	l.	l.	l.
	Yam ...	Sea	South (see West)	Ps. cvii, 3	*	l.	*	l.	*	l.
	Mesēmbria (Greek).	Mid-day and so south.	South	Acts viii, 26	*	...	*	l.	*	*
North.	Semali ...	Left hand or L. side.	Left hand or L. side.	I Kings vii, 21, 39 ...						
				II Kings xi, 11 ...	l.	...	l.	*	l.	l.
				II Chr. iii, 17; xxiii, 10						
	Semol ...	Ditto	Ditto ...	Gen. xiv, 15	l.	...	l.	*	l.	l.
				Josh. xix, 27... ...						
				I Kings vii, 39, 49 ...	l.	...	l.	...	l.	l.
				II Chr. iii, 17; iv, 6, 7						
				Job xxiii, 9	l.	...	l.	...	*	*
	Mezarim...	Scattering wind	North	Job xxxvii, 9	*	l.	*	l.	*	*

The star * means a cardinal point; the letter l. means literal rendering.

ones. If the literal rendering were always given, and if a short explanation were made at the beginnings of all Bibles of the ancient way of regarding the East as the front, every reader would be able to judge for himself from the context when front, left, etc., meant East, North, etc., and several marginal readings might be avoided. It would then be clear that Solomon's temple was oriented like the Tabernacle in the wilderness (Ex. xxvi, 22; 1 Kings vi, 16, R.V.).

At the present time we in England employ a somewhat similar plan in topography; we speak of the right or left bank of a river, and we give a clear impression of our meaning to anyone familiar with the conventional plan, that the right bank is that on the right hand of anyone looking down stream. It is somewhat remarkable that we now look *down* the course of the stream, but the ancient Hebrews looked *towards* the course of the Sun, and many modern Easterns do the same.

In this connection Job xxiii, 8, 9, R.V., calls for attention:

"Behold, I go forward, but He is not there;
And backward, but I cannot perceive Him;
On the left hand, where he doth work, but I cannot behold Him,
He hideth Himself on the right hand that I cannot see Him."

The cardinal points are almost certainly intended in this passage, and they are so rendered in both French and Spanish, but not in either our A.V. or Revised Versions. The mention of hiding Himself on the right hand probably refers to the hiding of His works, *i.e.*, the stars, in the south, a fact also alluded to in the expression, "Chambers of the South," in Job ix, 9, when again the full meaning appears to have been missed by our translators in both versions, but recognised by both the French and Spanish, as they correctly give "chambres cachées" and "lugares secretos" as the meaning of the word which we render simply "chambers."* The hiding of the stars below the horizon in the south must have been noticed by travellers in Bible times, specially by voyagers on the Nile, which stretches north and south through many degrees of latitude. A description of the south as a place where stars

* In Sanscrit the Rev. A. Margöschis states that avācī, meaning "lower region," is a word used to express the South. The Rev. A. Elwin, late missionary in China, states that in Chinese, South, is "below." The Rev. W. C. Whiteside, Western India, says that South is sometimes described in Sanscrit as "the door." South is also called yāmayā in Sanscrit from yāma, the God of death. The connection between the hidden chamber and the dead seems to be obvious from Gen. xxiii, 4 and 8, "Bury my dead out of my sight."

are hidden from one stationed in northern latitudes is a very natural one; I myself well remember being struck with a full view of the brilliant star Canopus high in the heavens, when in more southern latitudes. This star is of course never visible to us in England, being hidden from view below the horizon in the south. The "working" on the left or north in Job xxiii, 9, may refer to the revolving of the stars round the pole.

That the passage most probably indicates the points of the compass seems evident from the context: Job is desirous to discover Jehovah, "Oh that I knew where I might find Him," he says just before in verse 3, and then in the text under consideration he says in effect, "though I go to the sun rising, He is not there, to the sunset but I cannot perceive Him; to the mysterious north stretched over empty space (Job xxvi, 7), round which the constellations revolve, but I cannot behold Him; he hideth Himself if I journey southward and gaze on the stars hidden from us here, even there I cannot see *Himself*." Then by way of sharp contrast he adds in verse 10, "but *He* knoweth the way that *I* take." In Job ix, 7–11, the same thought of Jehovah's power over the sun and stars and of Job's inability to see the maker Himself "which doeth great things past finding out, yea, marvellous things without number," is expressed in somewhat similar language: "So He goeth by me and I see Him not: He passeth on also, but I perceive Him not." Modern Science notes some of the marvellous things, but utterly fails to find the Maker Himself.

In Job xxvi, 7, R.V., the description of the north as stretched over empty space, seems to accord with the idea in the modern Arabic word for north, which means "void" (Rev. W. G. Pope), and with the Tibetan chang "clean," or "purified" (Colonel Waddell); perhaps our own word north may mean no (sun) or void (of the sun).

The east sometimes in the Bible means a country in that direction; as the west is spoken of as behind or hinder; and as the Mediterranean Sea (which was essentially *the* sea) was on that side of Palestine, the word for sea often signifies west,* and it is consequently translated "west" no fewer than 69 times; as this was so often done, it would appear that in Ps. cxxxix, 9, "If I take the wings of the morning, and dwell in the uttermost part of the sea," that the word "west" in

* Mr. G. Michell of Casa Blanca on the Atlantic coast of Morocco states that the Arabic word for sea, signifies "west" there at the present time.

English would probably convey the meaning intended much better than the word "sea." The contrast between the brightness of the morning in the east, and the figure of extreme darkness in uttermost west seems intelligible, more particularly as the passage goes on to say that darkness cannot hide from God. The employment of the word "sea" in English destroys this sequence of ideas. All the four versions, however, use the word "sea," and none of them even gives a marginal note that the "west" might be intended. It is somewhat remarkable that the word "Yam," the sea, so often translated "west," is once rendered by the word "south" in the text of both A.V. and R.V. (Ps. cvii, 3).

The Negeb, the dry hilly southern part of Judaea, is always translated the south or south country; in one case in the R.V. (Gen. xiii, 1) it would appear better to have used the name of the country instead of the expression "the south," as Abraham did *not* go in a southward direction, when he went from Egypt to the Negeb.

There is apparently no trace in the New Testament that the east was regarded as the front, and that the other cardinal points were grouped in relation to it; on the contrary, it seems that the modern European idea of the vertical plane of the meridian being considered the fundamental one had arisen and prevailed, for the word *mesēmbria*, which originally meant mid-day, also signifies south, and it is so translated in the text of Acts viii, 26, of both our A.V. and R.V. As the same double meaning is attached to the French and Spanish words "midi" and "mediodia," and as both their versions give only "south" in the passage under consideration, the marginal reading "or at noon" in our R.V. may be unnecessary.

It is interesting to note that the Latin *meridies*, from which the French and Spanish words are both derived, has entirely lost its meaning of "noon" on entering the English language, since our word "meridian" only signifies direction.

Orientation.—In the earlier books of the Bible, the points of the compass are very often alluded to, as for instance in the description of the orientation of the Tabernacle, and of the position of the tribes around it in the wilderness, and in agreement with this modern research tells us that ancient temples were generally carefully placed in directions indicated astronomically.

Tabernacle compared with Heathen Temples.—Comparing an ordinary heathen, Egyptian, or Greek temple with the tabernacle in the wilderness, we find a general agreement in the

following points; they were each oriented, rectangular in plan, symmetrical on either side of a central line, and provided with an inner sanctuary and with rows of pillars. But when we come to the arrangement of the pillars we find a vital difference.

We have seen that in heathen temples dedicated to astronomical deities, a clear course is allowed down the centre from the entrance to allow the light of the rising sun or star to shine into the inmost holy recesses. This necessitates an even number of pillars on the front, as may be seen at St. Paul's in London, St. Peter's in Rome, etc., which are copied from the antique. It may perhaps be said that beauty of appearance also demands a central entrance. It is consequently remarkable that the number of pillars in front of the tabernacle was odd; while the number placed between the holy place and the most holy was even* (Ex. xxvi, 32, 37; xxxvi, 36, 38; see fig. 2).

The glory of the Lord was *within* the most holy place of the Tabernacle and of the Temple (Ex. xl, 35; II Chron. vii, 2; see also Rev. xxi, 23, xxii, 5), consequently there was no need to make arrangements for light to come in from outside. Even had the veil been lifted and the strict orders against entrance into the most holy place been relaxed, the odd central pillar would have prevented the light of the rising sun from entering effectively; may we not therefore look upon this central pillar as a protest against the worship of the heavenly host?

Solomon's temple was the direct successor to the Tabernacle, and we find several of the dimensions of the one simply doubled in the other (Ex. xxvi, 16, 18, 22; I Kings vi, 2, 20) thus:—

	Length.	Breadth.	Height of Most Holy Place.
Tabernacle ...	30 cubits.	10 cubits.	10 cubits.
Temple	60 „	20 „	20 „

* It has been said by some, that the central pillar was necessary, in order to carry one end of a ridge pole (which, however, is not mentioned in the Bible). But even if this were so, the light of the rising sun would have still been obstructed; it would not have been difficult to have carried the ridge pole (if it existed) on a short cross piece supported on two pillars, if an unobstructed central space had been desired.

The four pillars between the holy and most holy places in the Tabernacle gave five openings: these were replaced in the Temple by one opening (central by symmetry), one-fifth of the whole, furnished with doors or doorways; two-fifths of the front on each side were presumably boarded up (1 Kings vi, 31–34).

The five pillars on the front giving entrance to the holy place in the Tabernacle from the outside gave six openings; these were replaced in the temple by two openings, each furnished with doors, which symmetry demanded should be on each side of a central pillar; each of these doorways occupied one-eighth of the front. Had these doors followed exactly the same rule as the other doors leading into the most holy place they would each have been one-sixth of the front; but the increase of actual frontage over that of the Tabernacle permitted the proportionate width of the doorways to be reduced; thus though *some* change was made, the central pillar arrangement which blocked the entrance of the sun's rays apparently remained unaltered. This seems evident from the marginal reading of the A.V., but the R.V. does not make this meaning quite so clear.

The description of the Temple in Ezek. xli, 2, 3, is rather obscure; but it would appear probable that the entrance to the holy place was in two parts, "five cubits on the one side, and five cubits on the other side," *i.e.*, two doorways with a central post between them. The entrance to the most holy place was apparently only one opening, as there is no mention of "in the one side" and "on the other side."

Direction.—The Hebrews were not a maritime nation, and we find little allusion to the use of the heavenly bodies for the purposes of navigation: we may, however, notice two passages (Job xxxviii, 32, R.V.), "Canst thou guide the Bear with her train." (The Arcturus of this passage and of Job ix, 9, in the A.V. is evidently a mistranslation.) The constellation of the Bear was in those days much nearer to the pole than now, and it consequently must have served to point out the then pole star quite as effectively as it now does the present one; the thought seems to be "are you able to guide that which guides the mariner"? In Acts xxvii, 20, R.V., "when neither sun nor stars shone upon us for many days," the thought seems to be that the danger was great because the means of guidance was not available; had it been intended to say that their hiding indicated cloudy bad weather, we should expect to find the moon mentioned also; but mention of the moon is probably

omitted because it could hardly have been of use for purposes of navigation.

(5) The Heavens.

From a remote period it has been found convenient to divide the heavens into three regions, viz., those containing :—

1. Circumpolar, non-setting stars.
2. All other visible stars, *i.e.*, those rising and setting.
3. All remaining stars hidden under the horizon in the south.

Job ix, 9, R.V., mentions "the Bear, Orion and the Pleiades and the chambers of the South," and thus enumerates all these regions; (1) The very conspicuous constellation of the Bear was then non-setting in those latitudes, and consequently represented the rest of the non-setting stars; (2) Orion and the Pleiades, the rising and setting stars; and (3) the (hidden) chambers of the South contained the remainder.

(1) *Non-setting stars.*—Some of the non-setting stars had a practical value in giving direction, as we have already noted: if proper allowance is made for the time of year, the constellation of the Great Bear, or the Great Clock of the North, as it has been called, gives the time at night with considerable accuracy, especially if a dial face, anciently called a "nocturnal," is placed over it and the pole star. The non-setting stars collectively typified the evil powers of darkness, which were only vanquished by the rising of the sun. The old story was that Merodach had a fearful conflict with the dragon. This was poetically pictured in the heavens by the constellation Draco, one of whose stars, towards the tail, was the pole star of some 4,500 years ago; the body of Draco was consequently apparently transfixed by an invisible spear (the axis of the earth produced), and the two parts of the creature revolved around it, giving the idea of twistings about in agony. The rising of the sun caused its entire disappearance, and so apparently completed its destruction. Our figure of St. George and the Dragon on the British sovereign possibly owes its origin to the first part of this ancient story. "His hand hath pierced the swift serpent" (Job xxvi, 13), probably has an astronomical reference and indicates that Jehovah causes the constellation Draco to revolve, and consequently all the other stars as well; it may perhaps also refer in poetic language to His supreme power in overcoming all evil.

The seeming destruction of the stars caused by the rising

sun was an ancient figure of speech, and it is probably used in II Thess. ii, 8, R.V., "That wicked . . . whom the Lord . . . shall bring to nought (katargēsei) with the manifestation of His coming." In Nahum iii, 16, 17, "the stars . . when the sun ariseth they flee away," bears out the same idea —if it is allowable for the verb to refer to the stars as well as to the locusts—and both refer to the great men of Nineveh. "He must increase but I must decrease" (John iii, 30), may be derived from a similar idea, as the morning star, herald of the dawn, modestly decreases very much, but (at its brightest) does not disappear altogether, on the rising of the orb of day. John the Baptist may perhaps here be likened to the morning star,* as "he was not that Light, but was sent to bear witness of that Light" (John i, 8; see also Mal. iii and iv, 2).

At the beginning of the Lord's ministry, which was probably in the autumn, John twice repeats the sentence almost in the same words (John i, 15 and 30, R.V.), "After me cometh a man that is become before me, for he was before me," a phrase quite in accord with the figure of the morning star and the sun.

In John v, 35, R.V., the Lord speaks of the Baptist as "the lamp that burneth and shineth: and ye were willing to rejoice for a season in his light." The name for Venus of "Light" or "Lamp" is no uncommon one. With regard to the phrase "rejoicing in his light," an Egyptian, Atallah Athanasius (associated with Dr. Harper of Cairo), states that "travellers by night when they see the morning star rejoice exceedingly, and sing special songs in its honour, calling it 'the release,' because it announces that the troubles of night and its darkness are coming to an end."

If, as is probable, John made his comparison (John i, 15, 30) and the Lord made His comparison (John v, 35) to the morning star at times when it was distinctly visible towards the end of each night, we have a probable indication of the exact date of the Crucifixion, which is generally believed to have occurred within the dates 29 and 33 A.D.

Mr. Wickham, Senior Assistant, Radcliffe Observatory, Oxford, has calculated for me that the planet Venus was at its brightest as the morning star about 10th July, 28 A.D., and again about 14th February, 30 A.D. new style, or 27th June, 28 A.D., and 1st February, 29 A.D., old style (for the old style year began on the 25th March); this involves its shining as the morning star for about three weeks before and two or three

* See *Mimpriss' Gospel Treasury*, section xiii, part ii, p. 132.

months after those dates, *i.e.*, in the autumn of 28 A.D. and in the spring of 30 A.D. The former of these periods may well have contained the commencement of the Lord's ministry, and the latter the second passover, which is generally thought to be indicated in John v, 1. As the Crucifixion was at the fourth passover, its date would thus be 32 A.D. or 29 A.D. It must be confessed that this is not strong evidence but only a possible inference.

The planet Venus as morning star is much better known by Eastern peoples at the present time than by us. Some farmers in India and others in the East notice its appearance in broad daylight. *We* may think a figure derived from the planet as far-fetched, but it was doubtless very familiar to the ancient Jews.

(2) *The rising and setting stars.*—The second region contains the rising and setting stars; practical use was made of them because when some of them rose with or just before the sun, the seasons of the year for various agricultural operations were indicated. According to Dr. Takakusu, Professor of Sanscrit, Tokio, the farmers of parts of China and Japan, where almanacs are not so plentiful as with us, still make use of them for these purposes. Some 600 B.C. Hesiod wrote of the Pleiades, "begin harvesting at their heliacal risings, but plowing when they set."*

The practical value of the Pleiades to the farmer due to its position in the heavens probably explains the references to the cluster in Job ix, 9, xxxviii, 31, and Amos v, 8, R.V. Orion, the most brilliant of the constellations, is also mentioned in the same three passages, probably as representing all the rest. In Is. xiii, 10, the same Hebrew word is used, but it is there translated "constellations" instead of Orions in both our A.V. and R.V.

This second region of the heavens contains the band of stars called the Signs of the Zodiac, which is described as the tabernacle of the sun (Ps. xix, 4). The signs of the zodiac are surely referred to in II Kings xxiii, 5, and in Job xxxviii, 32, as is indicated in the marginal readings of both A.V. and R.V. The texts of both the versions, however, are not helpful, the Hebrew word Mazzaroth or Mazzaloth only occurs in these two places, but is translated "planets" in one case, and simply Mazzaroth is given us in the other. No doubt, apparently,

* Agricultural operations in Egypt and Persia are still regulated by the heliacal risings.

entered the minds of either the French or Spanish translators, as both have given the meaning as the signs of zodiac in both places; this seems quite consistent with the context of Job xxxviii, 32, R.V.: "Canst thou lead forth the Mazzaroth in their season?" as the leading forth of the signs of the zodiac with respect to the sun influences the seasons.

(3) *Hidden Southern Stars.*—The third region of hidden southern stars calls for no further note: when discovered by one journeying south, they naturally linked themselves to the other rising and setting stars.

Job xxxviii, 31, 32, R.V.: "Canst thou bind the cluster of the Pleiades, or loose the bands of Orion? Canst thou lead forth the Mazzaroth in their season? or canst thou guide the Bear with her train?" enumerates what may be called the useful visible constellations; Pleiades and Orion indicated the time for agricultural operations; the signs of the zodiac the sequence the seasons; and the Bear was the guide to the mariner.

(6) Grand Astronomical Statements.

In ordinary ancient astronomy there were various theories about the shape of the earth and the method of its support; in the Scriptures we have the simple statements, "the pillars of the earth are the Lord's, and He hath set the world upon them" (1 Sam. ii, 8, see also Job xxxviii, 4, Ps. lxxv, 3, Prov. viii, 29), and "He hangeth the earth upon nothing" (Job xxvi, 7). The globular form of the earth is thought by many to have been unknown to the ancients: but it appears that (Is. xl, 22) He "sitteth upon the circle of the earth" of both our Authorized and Revised Versions would be more accurately translated, He "sitteth upon the globe of the earth." Both the French and Spanish agree in translating the Hebrew word "khug" as "globe."

The globular form of the earth is also inferred from the Lord's statement that at His sudden coming (Luke xvii, 24), some will be in bed, presumably at night (Luke xvii, 34), while others will be working at their ordinary occupations (Luke xvii, 35, Matt. xxiv, 40, 43), presumably in the day-time. Day and night at the same instant at different parts of the earth are quite consistent with its spherical shape.

According to the observations of modern astronomers, there are less than 6,000 stars in all the heavens visible to the unaided human eye. In the Scripture, however, they are repeatedly spoken of as very numerous indeed, and in some

cases their numbers are mentioned in conjunction with the sand upon the sea shore innumerable; now 6,000 grains of sand do not fill a very large space, and the linking together of these two examples of large numbers might not have appeared very apt to the first hearers. (Gen. xv, 5; xxvi, 4; Deut. i, 10, x, 22, xxviii, 62; Jer. xxxiii, 22; Nahum iii, 16; Heb. xi, 12). But when telescopes were invented, the numbers which could be seen rapidly grew to hundreds of thousands, and of late years to millions; and when photography came to the aid of astronomy, pictures appeared of other stars (never even yet seen by human eye in the most powerful telescope), and the totals now reach hundreds of millions. Of late years the spectroscope has confirmed what was previously only a suspicion, that many bright stars have other dark ones revolving with them. Sir Robert Ball tells us that "the brilliant objects that we see, though they are overwhelmingly numerous, yet they must be absolutely as nothing in comparison with the myriads of dark objects which are totally invisible to us, except when certain very remarkable circumstances occur." Thus our modern Science humbles us by showing that it is more difficult than it appeared at the time to comply with the demand, "tell the stars, if thou be able to tell them" (Gen. xv, 5). And it enables us to see a fuller meaning in the grand and simple statement, "He telleth the number of the stars" (Ps. cxlvii, 4).

The lately recognised dark stars of the modern astronomer may perhaps be referred to in Jude 13.

Except that a few of them were used for the practical purposes of finding the time and the latitude, the bulk of the stars were not of much interest to scientific astronomers a few years ago; though of course different magnitudes were assigned to them, and differences of colour were observed, some were noted as double and others as variable in their light. But now-a-days, with the aid of the spectroscope, it is found that all are moving with great and diverse rapidity; some are one thousand times as brilliant as our sun, while others are less so. Instead of the old apparent monotony among the stars, Professor S. Newcomb now writes: "Most remarkable is the diversity of their actual luminosities or the amount of heat and light which they individually emit. The whole tendency of recent research is to accentuate this diversity." Thus now-a-days, thanks to recent science, we can see more force than formerly in the words of Scripture, "one star differeth from another star in glory" (1 Cor. xv, 41), and our present knowledge of the

immensity of stellar distances greatly adds point to the words of Eliphaz, "Behold the height of the stars, how high they are" (Job xxii, 12).

(7) Figurative Allusions.

When the human race was a few thousand years younger than it is at present, sunrise was pre-eminently the type of increasing power; but we modern English in our northern latitudes have a very early daybreak in the summer time when the weather is fine and clear, and our present habits of late rising prevent most of us from being astir at that time of day; in our winter the skies are frequently cloudy and dull, and the glories of sunrise are veiled; the consequence is that we have little practical experience of the beauties of daybreak, and so the Bible accounts of it do not come with so much force to us as to those who lived in more southern countries, and frequently witnessed it. There are still, however, two powerful eastern nations, Persia and Japan, which employ the symbol of the rising sun as their national emblem. In the Scriptures abundant use is made of sunrise as a figure of strength and joy: the sun is said "to rejoice as a strong man to run a race" (Ps. xix, 5). Other joyful references to it are, "The day spring from on high hath visited us" (Luke i, 78). "The path of the righteous is as the light of dawn, that shineth more and more unto the perfect day" (Prov. iv, 18, R.V. marg.). "Then shall thy light break forth as the morning" (Is. lviii, 8).

On the other hand, the withdrawal of the light of the sun, and also of that of the moon and stars, is an emblem of sorrow: "The sun and the moon are darkened and the stars withdraw their shining" (Joel iii, 15). Intensity of sorrow is shown by an unexpected quenching of the grateful light of day. "Her sun is gone down while it is yet day" (Jer. xv, 9). In the same strain a period of lasting joy after sorrow is spoken of as a time when "Thy sun shall no more go down . . . the days of thy mourning shall be ended" (Is. lx, 20).

In this connection it is interesting to note the text, "Until the day dawn, and the shadows flee away" (Song of Solomon, ii, 17, and iv, 6, A.V.), which certainly gives the idea of dawn, and it has consequently been taken as a type of resurrection. The words "be cool" in R.V., however, make it appear that evening is the time intended: according to Professor Margoliouth, the word used for "fleeing away" refers to odours diffusing themselves, and one would think might as well refer to the

shadows disseminating themselves over the earth at night as to their disappearance altogether in the morning; the word translated "break" in A.V. and "be cool" in R.V. is difficult. On the whole the probability seems that the evening is intended, the context is certainly not opposed to that view, and the movement of shadows in other parts of Scripture seems generally to refer to evening (Job vii, 2; Ps. cii, 11, cix, 23).

It must have been no uncommon sight to see a few flat clouds or mist low on the horizon at dawn, in the Eastern sky in Bible lands in Bible times, and when the sun rose, they must have caught some of its radiance, almost appearing to be a part of the luminary itself; a very natural poetic idea would call them wings to assist its upward flight.

In Mal. iv, 2, we are told, "Unto you that fear my name shall the Sun of righteousness arise with healing in His wings." And in Ps. cxxxix, 9, the wings are also associated with the rising sun, for the expression is "wings of the morning."

This thought seems to be carried out in the numerous carved images of the solar disc with long lateral wings (emblems of divinity, see Fig. 1) so often to be seen in ancient temples, etc. (probably the tails of some of them represented the downward rays of the sun sometimes to be seen when it is near the horizon); the differences in design in Egyptian and in Assyrian winged suns may be due not only to differences in the national art of the two countries, but also to the differences in the morning cloudscapes of rainless Egypt and of the more clouded sky of the country near the hills to the north of Assyria. Compare A and B with E and F, Fig. 1. The winged solar discs, emblems of divinity, are not improbably the sun images forbidden to the Hebrews (Lev. vi, 30, etc.). Let us not be alarmed at this coincidence; Scripture allows and uses the language of imagery in worship; but it forbids the construction of the actual images themselves for the purposes of worship.

Another symbolic meaning of wings was to signify care or protection (Ps. xvii, 8, lvii, 1; Mal. iv, 2; Matt. xxiii, 37); this thought may possibly explain Ps. lxxxiv, 11, "The Lord God is a Sun and Shield." The sun symbolises His active power and the wings His shielding care of His people.

It is doubtful whether the moon, which reflects the sun's light to the dark world, is "the faithful witness" of Ps. lxxxix, 37, or whether the rainbow is intended.

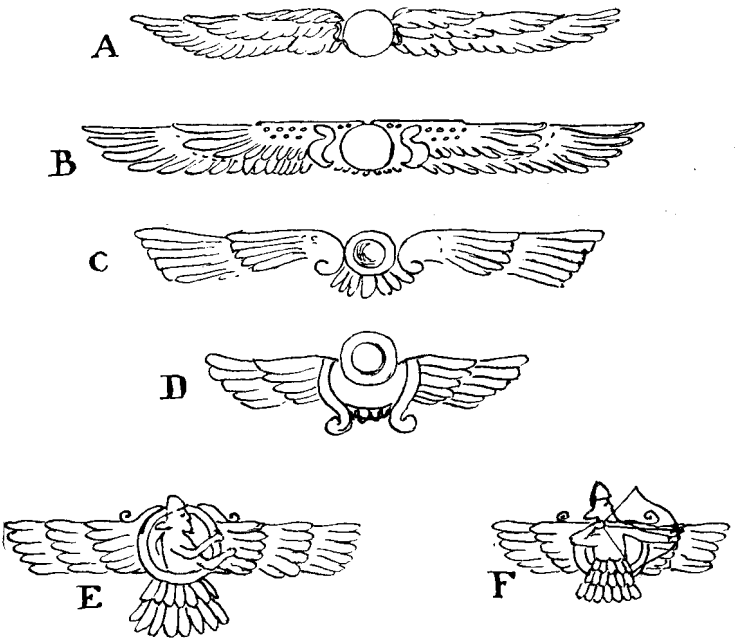
The infinitudes of space grandly picture the infinite majesty

and grace of Jehovah, "As the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts" (Isa. lv, 9). A similar beautiful comparison is also employed in the following double couplet:

"As the heaven is high above the earth,
So great is His mercy towards them that fear Him.
As far as the East is from the West,
So far hath He removed our transgressions from us."
Ps. ciii, 11, 12.

FIG. 1.

WINGED SOLAR DISCS.



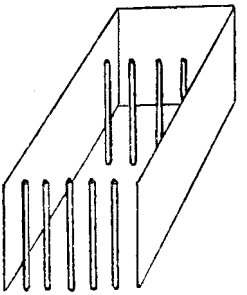
In Fig 1
A and B are
EGYPTIAN
from the British Museum.
A about 1300 B.C.
B " " 130 B.C.

C and D are
HITTITE
from History of Art in Syria &c,
Perrot and Chipiez.

E and F are
ASSYRIAN
from the British Museum
both about 800 B.C.

FIG. 2.

THE TABERNACLE.



APPENDIX.

Explanation of Changes of Amplitude of the Risings of Stars.

If a top (Fig. I) is spun and slightly tilted over, it will perform a number of slow gyrations, and the highest point will slowly describe a horizontal circle (shown by the dotted line) round a centre E, which is vertically above the lowest point.

Take a precessional globe (Fig. II), which has around it a vertical brass circle: another brass circle revolves inside it on an axis of which N is one of the pivots; and an ordinary celestial globe is pivoted inside this circle, E being one of its pivots. EN subtends about $23\frac{1}{2}^\circ$ at the centre C of the globe.

One revolution of the globe inside the inner circle corresponds to the slow precessional gyration of the earth, which is only completed in about 26,000 years.

One revolution of the globe and inner circle *clamped together* corresponds to one revolution of the earth on its axis in twenty-four hours.

Clamp the globe and inner circle together so that N becomes the north pole (N being elevated about 30° to suit the latitude of Memphis in Egypt), it will then represent the heavens at the present time; the star (Arcturus) rising at P when revolution ensues.

Unclamp the globe, revolve it through $62\frac{1}{3}^\circ$ and clamp it again to the inner circle, so that N′ takes the place of N as the north pole; then the condition of things about 4500 years ago (B.C. 2596) is represented, because $\frac{62{\cdot}34}{360} = \frac{4500}{26000}$

Through N′ runs the constellation Draco, and *a* Draconis was then very near the pole, and was the pole star for a long period before and after that time; it will also be noticed that the constellation of the Great Bear was then nearer to the pole than it is now.

When revolution ensues the star (Arcturus) will rise at P′ instead of P, for as N′ has been moved to the right, the star must shift also, since N′P must equal NP′.

Thus the magnitude of the horizontal angle PCP′ represents the change in amplitude in the rising of Arcturus at latitude 30° in that period of 4500 years, and the angle consequently is a measure of time. E and the dotted circles have the same meaning in both Figs. I and II.

This slow gyratory movement of the axis of the earth also causes the sun at the equinoxes to appear to move through the belt of stars called the signs of the zodiac, of which Aries is one; as the whole belt is arbitrarily divided into twelve equal parts or signs, the movement through each sign takes a twelfth part of 26,000 years, or about 2,166 years. This apparent movement of the equinoxes was known long ago, and consequently the gyration received the name, now established by long usage, "the precession of the equinoxes."

APPENDIX.

FIG. I.

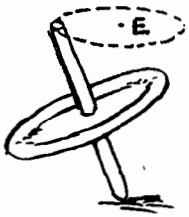
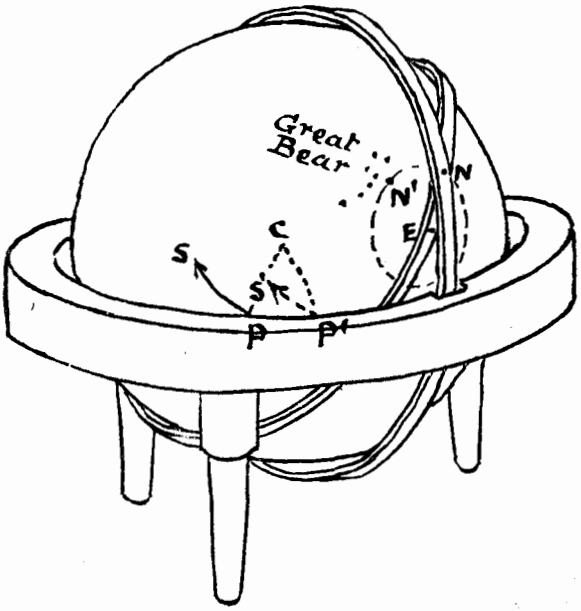


FIG. II.

PRECESSIONAL GLOBE.



Discussion.

The Secretary.—I should like to mention that the author of the paper, Lt.-Col. G. Mackinlay, is not unacquainted with practical astronomy, as he was second observer in the British expedition to make observations on the transit of Venus in 1882 in Jamaica, when he took independent observations. Dr. Copeland, the present Astronomer-Royal for Scotland, was the first observer. You will thus see that Colonel Mackinlay is well qualified to deal with the subject of Biblical Astronomy.

Mr. Harding.—Mr. Chairman, ladies and gentlemen, I have been asked to give my testimony as to the astronomical ideas of the people of Palestine to-day, and more particularly of the Bedouins. After some years in contact with the Bedouins, I have come to the conclusion that their ideas are very vague indeed. They know the names of the signs of the zodiac, but I doubt whether they could point out the signs in the heavens. However, they can tell the time by the stars. When one has been travelling by night, and has asked them the time, looking around they would make a fairly good guess as to what the time of night was. During the day they certainly would tell the time by the sun, but they never could tell with any accuracy when the sun was more than halfway up from the horizon. They hold the hand at arm's length between the face and the sun, and show how many fingers the sun is from the horizon. But I have noticed and was struck by the regard that the Bedouin had for the morning star. I think that if that friend of Colonel Mackinlay's who doubted the possibility of rejoicing in the light of Venus had ever spent a night on the open desert, with its discomforts, he would rejoice in the light of the morning star. Always when a Bedouin comes into the tent before dawn the first thing he is asked is, "Has the star risen?" Just as a lazy British workman, we may say, turns over to his friend and says, "Is it six o'clock yet?" so the lazy Bedouin turns round and says, "Has the star risen?" I can fully corroborate what Atallah Athanasius has said about the travellers in Egypt rejoicing in the light of the morning star. On a night when there is no moon, the light of Venus

does make a decided difference. I have proved that when riding with one's back to the east, I have been able to tell that the star had risen by the difference in the light.

There are just two points in Colonel Mackinlay's paper that I should like to draw attention to with a view to getting a little information from any Hebrew scholars who may be present. In connection with the points of the compass, the Bedouins and the Arabic speaking peoples evidently originally fixed their points of the compass by the way they were looking, that is to say, to the east. The universal word for north in all Arab dialects is the word for left hand, and in certain parts the word for the right hand also indicates the south. In connection with this see the verse in the xxiii chapter of Job, quoted by the lecturer. It is extremely probable that the points of the compass are here indicated, and some versions (including modern Arabic) translate accordingly. But I should like the opinion of Hebrew scholars as to whether we should take the *south* as the place of hiding. I do not know very much about Hebrew, but it seems to me that the *north* is the place of hiding. The common word for north, *tsāphōn*, means *hidden*. It is strange that the same idea should be connected with the south. In the passage in Job ix, 9, we get two words both meaning south. We get *cheder* and *temān; temān* must mean the south; *cheder* is given by the lecturer as one of the words used for south, and it also means a secret place or chamber.

And then the second point was with reference to "yam," the sea, which usually means west. In this particular passage in Psalm cvii, 3, it is translated south. There is no doubt that it means south. How does it come to have this meaning? It is connected with the word north, *tsāphōn*, and the same collocation occurs in Isaiah xlix, 12, where our translators translate it north and west. But it struck me at once on looking at this, and I think it is an idea that is supported by some scholars, that the word "yam" here is really a contraction of "yamin," which is the ordinary word for south. Possibly as this is the only instance in which "yam" seems to mean south, that might be the explanation. One would like to hear what Hebrew scholars have to say about it.

Commander W. F. CABORNE, C.B., R.N.R.—While glad of the opportunity afforded me for saying a few words in appreciation of Colonel Mackinlay's thoughtful, valuable, and interesting paper, I

fear that the little attention I have hitherto paid to the subject of biblical astronomy will preclude my contributing much of value to its discussion.

However, with regard to certain miraculous astronomical events recorded in the Old Testament, and alluded to by the lecturer, it seems to me that if we accept as a fact that the planet upon which we live, and I am not going to enter into any controversy as to the opinions held by various scientists with respect to the earth's age or the manner of its formation, together with the sun, the moon and the vast myriads of other heavenly bodies pursuing their allotted courses through space, were created by the Supreme Spirit, whom we designate as God, then it is an equally simple matter to believe that the Great Architect of the Universe, in the exercise of His unfathomable wisdom and in the plenitude of His illimitable power, so temporarily dislocated or changed the working of the complex machinery which He himself had made, as to cause, without bringing about general destruction and chaos, the extraordinary astronomical phenomena which we are told, and know, have proved such stumbling blocks in the path of the faithful throughout subsequent ages of the world. To my mind, the two questions are indissoluble; if we accept the one we must accept the other, and if we reject the one we must reject the other.

Passing on; if, as the lecturer states, the astronomers of the present day are but little inclined to pay much attention to the scientific work of the ancients, the reason would seem to be intelligible. While those pioneers of astronomical science had certain glimmerings of the truth, that truth was more or less obscured and choked by erroneous matter; and with a vast field before them, which constant research is ever enlarging, modern observers may well be pardoned if they not unnaturally prefer to press forward rather than to look backward.

Nevertheless, it is not always safe to assume that the ancients were quite as ignorant as they are sometimes supposed and represented to have been. As an instance in point, I may mention that in the museum at Naples there is a case containing surgical instruments recovered from long buried Pompeii, and among those instruments is at least one which is identical with what is termed a modern invention.

Coming to the worship of the heavenly bodies by the ancients,

the Arabs before the time of Mohammed paid their devotions to the planets, stars, and various idols, but many of them at the same time, believed in one Supreme God the Creator and Governor of the Universe, and regarded their other deities rather in the light of intermediaries with the Almighty, and as subsidiary adjuncts of their religion. Mohammed sternly forbade the worship of all but one God, of whom he claimed to be the prophet, and in order to emphasise the absolute nothingness of the other objects of supplication, he, in the fifty-third chapter of the Koran, that sacred book of Islam so largely compiled from the Jewish Scriptures, declared that God is the Lord of the dog-star (Sirius), one of the celestial deities worshipped by the old Arabs.

The argument may be advanced that anything which obtained at the end of the sixth or the beginning of the seventh centuries of the Christian era had very little connection with systems current in Scriptural ages, but against this contention it may be urged that the East moves slowly, and that the same customs which existed at the commencement of the Hegira (which began July 16, A.D. 622) had probably obtained at least some centuries earlier.

As the Jews of old announced and celebrated the appearance of the new moon by the blowing of trumpets, and the Hindus in some places practice a similar observance, so the Mohammedans pay particular attention to the same manifestation. Those among us who have had experience of Eastern lands have witnessed the earnest anxiety exhibited for the appearance of the new moon which terminates the terribly severe fast of Ramadan and ushers in the feast of Bairam. Even the first appearance of the ordinary new moon is a cause of joy, and when a few years ago I was residing for a time in one of the protected native states (Bahawalpur) situated in the north-west of India, it was customary for the person who first sighted the Queen of Night, and reported her presence to the Nawab, to receive a present; then the members of the court tendered their felicitations to their ruler, and a salute of seventeen guns, the number allotted to his highness by the Government of India, was fired in honour of the auspicious occasion.

It is a difficult point to determine how far the ancient peoples were acquainted with the globular form of the earth. Personally, I am not competent to express any opinion as to the correctness, or otherwise, of translations; but with respect to the inference drawn

from our Lord's statement about what will happen at His sudden second coming, it is certain that He Himself, being Divine, was possessed of all knowledge, while His hearers, His disciples, who had not yet received the outpouring of the Holy Spirit, were anything but learned men.

According to Plutarch, Thales (sixth century B.C.) knew that the earth was a sphere, but it is now said that he looked upon it as being a flat disc; Aximander, about the same period, thought that it was cylindrical in shape; Pythagoras, a little later on, conceived it to be a sphere; Hipparchus (second century B.C.), the discoverer of the precession of the equinoxes, was of opinion that it was flat; while Ptolemy, some four centuries after him, held the view that it was sensibly spherical. Even at the commencement of the twentieth century there are people in England, possessed of some measure of education, who, notwithstanding overwhelming evidence to the contrary, maintain that our planet is flat.

Dr. HEYWARD SMITH.—I should like to draw attention to the constant recurrence in the paper of the expression "the Jews." On page 13, "when the Jewish nation had reached the summit of its glory, Solomon's temple was dedicated," etc. It is rather evasive, because we know the Jews were not called Jews until after. They were called Israel or Hebrews.

Mr. MARTIN ROUSE.—When Job used the words, "God stretches out the north over empty space and hangeth the earth upon nothing," it is clear that he did not believe that the earth was supported in some fabulous way—such, for example, as the Brahmins conceived, on the back of an elephant which stood on the back of a tortoise; or, as the Grecians conceived, upon the shoulders of Atlas; but he believed that in some wonderful way God held it poised without support in space.* At the same time, the statement that He stretches out the north over empty space shows that the speaker knew that the earth was round—not necessarily globular, but certainly round; because, if the earth were a square or oblong figure with northern, southern, eastern and western sides, the north would not have been stretched out over empty space, but would have been a long line of earth;

* Therefore when the same speaker (in chap. ix, 6) said that God causes the pillars of the earth to tremble, he must have alluded in a poetic way to the inward supports of the earth's mighty crust.

whereas, if the earth is round, then of course the north is stretched over empty space, there being an imaginary line called north which touches the earth as a tangent of a circle at one point alone.

Respecting the Hebrew word *khug*, of whose employment in Isaiah xl, 22, Colonel Mackinlay has spoken, and which both our A.V. and R.V. there render "circle," the same word in Prov. viii, 27, is rendered by the A.V. "compass" and by the R.V. "circle," the full clause in the R.V. being "He sets a circle upon the face of the deep"; and it is plain that the circular horizon of the sea is intended. So, too, where in Job xxvi, 10, R.V., we read that He "described a boundary upon the face of the waters," the verb *khag*, translated "described," clearly means *drew a horizontal circle.* But in the passage before us, "It is he that sitteth upon the circle of the earth, and the inhabitants thereof are as grasshoppers," since God could have contemplated all men only from above, not a horizontal, but a vertical circle must have been signified—that is, a meridian circle from zenith to nadir, which can exist *only if the earth be a globe.*

I think with Colonel Mackinlay that, besides a figurative, spiritual meaning that the five pillars of the tabernacle entrance probably possessed, they were also designed to prevent the worship of the sun, while the fact which he has further brought to light, that Solomon's temple had also a central blank wall between two entrances, instead of the customary and majestic central doorway of temple or palace, confirms this view, for whereas the type (if it be a type) is changed, the same striking departures from custom is maintained.

Professor Ramsay has determined that the Saviour must have been crucified either in 28 or 29 A.D., and almost certainly in 29; and it is remarkable indeed, as Colonel Mackinlay has shown us, that when we take 29 as a date, and treat the morning star as alluded to in the figurative language used concerning John the Baptist (the forerunner of Christ, the Sun of Righteousness), the allusions all fit with the presence or absence and luminosity of Venus before the dawn. As regards the last recorded testimony of the Baptist (in John iii, 27–30), it must have been uttered between four and five months before the end of the year 27, when Venus was just beginning to be a morning star; for what called forth the testimony was the complaints of John's disciples that all men were going to Jesus instead of John for baptism; and the next thing recorded is that "therefore" when Jesus knew that this report had

reached the Pharisees, He withdraws into Galilee by way of Samaria, and during His few days' march through that province He is recorded to have incidentally observed that four months had still to elapse before harvest, or in other words before the passover (John iii, 26, and iv, 1, 35; cp. Jos. iii, 15, iv, 19, and v, 10, etc.).

The SECRETARY.—I should like to have an opportunity of referring to what I understood Captain Caborne to refer to when he spoke of the sun standing still, and the moon in the time of Joshua. It has been a great stumbling block to some believers in the Bible, arising entirely from us westerns forgetting that the poetical passages of the Scriptures which never were intended to be taken literally. Of course no man of science can believe that the Almighty brought the whole of this universe to a standstill in order to effect any purpose whatever. It is quite unthinkable; but the whole thing is explained as a poetical quotation from the book of Jasher, "Is not this written in the book of Jasher, so the sun stood still and the moon over the valley?" It is a poetical quotation from a work not in the Scriptures itself. I believe this explains the passage.

Colonel HENDLEY, C.I.E.—On page 124 Colonel Mackinlay speaks of the invariable orientation of the temples in the East. Some time ago I was asked by Sir Norman Lockyer to make some observations regarding the orientation of Indian temples. I found there was really no very definite rule at all, and the temple of the sun pointed to the north: it had nothing to do with the sunshine. The only important point seemed to be that the doorway of the temple should not point to the south or the region of the demons. However, Hindus do so far believe in the effect of the sun and moon on the images, that on certain nights the images are taken out and bathed in the moonlight. Very few people really realise the importance of astronomy and still more of astrology in the East. Almost every act of a native is foretold by the astrologer. His marriages are regulated by it, and a rich man will have his horoscope made up every year; so that a friend of mine had one which was 30 feet long. When a coronation takes place it may be regulated by the sun. I was present at the coronation of the Desert King, the Maharajah of Jodhpur, and we waited until the sun rose above the horizon for a lucky moment, when the mark of investiture was made on his forehead.

Something was said in the paper about the Brahmans. Last night,

when an eclipse of the moon occurred, if we had been in India we should have found the populace blowing horns and beating drums to frighten away the demon who was swallowing the moon.

Everybody knows in India that the sun, moon, and different stars are supposed to be witnesses to any great event. So also one often sees near the temples a slab on which are carved figures of the sun and the moon, to bear eternal witness against anybody who dares to resume the land on which the temple was built. As regards the winged disc of the sun in India, it is very much easier than in more northern countries to see the sun rise. I have often ridden eight or nine miles before the sun rose, and have seen it rising with not unfrequently on either side of light white clouds which had the appearance of wings.

Professor ORCHARD.—I thank the author for this able and suggestive paper. I might express my own satisfaction that he has emphasized on page 127 the fact that certain astronomical facts were miracles, and in the next paragraph that the Bible records astronomical facts as they appeared to an ordinary observer. It would be perfectly absurd to speak the scientific language of the astronomer to people who do not understand the meaning of the terms. On page 132 the author has done well to remind us, in connection with the new moon and the Sabbaths of the Bible, that the Jewish arrangement of Sabbaths was not the same as that of the Babylonians. There are some people who imagine that it was, and that the Jewish arrangement was derived from the Babylonians. That is an error. It was not so derived, and both the Babylonian and Jewish arrangements were indicative of a primal revelation.

On page 145 the globular form of the earth is inferred from the statements of the xvii chapter of St. Luke and the xxiv chapter of St. Matthew. May I point out, however, that these statements carry more, that they prove the fact of the earth's rotation ; since at one and the same time there is early dawn, full daylight, and night. That of course leads us to see that the earth must rotate.

I wish personally to thank the author for the pleasure and the profit which we have derived this evening.

Rev. W. F. CONNOR.—The word "yam" is the same both in Hebrew and Arabic, and it is used in colloquial Arabic with the idea of "at all" or immensity. You say you have not seen a person *at all*. The word for north is *tsāphōn*. I only know one word for north

and that was the left hand side. There are three words in Arabic for north.

Then there is another point, and it is with reference to the laws of the Jews contrary to the sun worship. We may see almost any Polish Jew with his curls hanging down at the side of his face, and the idea is that he was not to comb his head so as to make his face represent the disc of the sun. And with reference to the moon and moon worship, we have in Hebrew the word for the crossing line, which means bright and shining and also to rejoice, and at the present day we see, especially on the Continent, figures of the Blessed Virgin and Child standing in the crescent of the moon, and we can trace that back. We can look also at the Turkish sign with the crescent and the star, and we know that they got it from the Besantines, and we trace that back to the very oldest periods, the Hebrew times, among the Hittites. We see how great an influence the moon has exerted upon the religions of the world, and its trace has come down to us at the present day.

I have very greatly enjoyed hearing the paper which Colonel Mackinlay has read.

The thanks of the meeting were accorded to the author for his communication.

COMMUNICATIONS.

Rev. JOHN TUCKWELL, M.R.A.S., writes :—

Colonel Mackinlay has dealt with a very interesting subject. It was of course impossible for him to exhaust it. I may therefore be excused perhaps for making some little addition to it. I have often been struck with the remarkable scientific precision of our Lord's words recorded in Matt. xxiv and Luke xxi. Concerning His second coming He says, "The sun shall be darkened and the moon shall not give her light." This latter disaster would of course follow from the former. But as the tides are produced by the attraction of the sun and moon, astronomical disturbances affecting these bodies would be sure to affect the ocean also. It is very remarkable therefore to notice how He goes on to speak of "the

sea and the waves roaring, men's hearts failing them for fear and for looking after those things which are coming on the earth," and I suppose the astronomers and others of those times will be very naturally looking out for other and consequent troubles to be apprehended.

Professor A. H. SAYCE, D.D., LL.D., writes from Cairo to Colonel Mackinlay:—

I have received the proof of your paper, in which I have been much interested. You have put all the facts into a lucid and complete form, and I do not think that they will have admitted of much discussion. Perhaps, if you are revising the paper, a few more words about the precession of the quinoxes might be desirable for the information of the uninitiated—explaining what is meant by "the first point of Aries," the length of time occupied in the precession from one point to the other, etc.

The Rev. Canon R. B. GIRDLESTONE, M.A., writes to Lieut.-Colonel Mackinlay:—

There is a great deal of work in your paper, and the subject is one of deep interest.

1. I observe that you refer to the sun and moon and stars in connection with Gen. i, but it is noticeable that neither the sun nor moon are named in the chapter, whilst the stars are referred to very slightly. There is undoubtedly a theological reason for this, and it is easily understood in the light of Chaldæan worship, which deified sun, moon and stars, regarding them as gods and goddesses."

2. I am not sure whether you have referred to "the Queen of Heaven" in Jer. xliv, 17–25: it seems to me an important passage.

3. The word "sabbath" in Hebrew simply means "rest" or "cessation," and is an ancient Semitic root.

4. Your remarks on the calendar are very instructive. It might be well to note, in addition, that the whole Old Testament contains no reference to "hours" until we reach the Book of Daniel. When did the Babylonians divide the day into hours?

5. With regard to points of the compass, some words were used rather vaguely, *e.g.*, the ordinary word for north, which you do not refer to, and which means the hidden or dark region (צפון). The word *semol* is never translated "north" in the A.V. When you enter the Red Sea from the south you have Yemen to the right

of you and Somaliland to the left. Is this an accident? I doubt it.

You have not referred in your table to the ordinary word for "east," or to the strange word (*darom*) translated "south" in several passages. There is a paper with a discussion on the Egyptian and Assyrian points of the compass in the *Proceedings Soc. Bibl. Arch.*, Feb. 1883, which is suggestive.

6. I have no doubt that there was a ridgepole in the Sacred Tent, but I never regarded the post which supports it as a protest against sun-worship.

7. There seems to be a strong *consensus* of opinion in favour of A.D. 29 as the year of the crucifixion, but the evidence is not quite decisive.

8. Our Lord said, "in my Father's house are many mansions." May this point to the existence of many habitable abodes somewhat like our earth? or are we to follow the teaching of Dr. Wallace?

Lieutenant-Colonel MACKINLAY, in reply, said:—I am grateful to all who have taken part in the discussion: the statements of Mr. H. Harding and of the Rev. W. F. Connor are specially valuable, coming as they do from those who have lived for years in Bible lands. I may here also express my gratitude to them and to many others, residents in the East, who have helped me in the preparation of this paper by replying to questions which I have sent to them about the practical use of the heavens now made by natives of various countries, and also about the words used in several of their languages for the points of the compass, etc.

Colonel Conder, in a letter to me, draws attention to the fact that the Hebrews of old proclaimed the new moon directly from the result of observation, and Commander Caborne gives us an interesting modern example of doing this in a Mahomedan country. I am glad attention has been drawn to this arrangement, as it can only be inferred from my condensed account of the need for a cycle in ancient times. The Hebrews had no means of foretelling the beginning of a lunation before the discovery of the Metonic cycle about B.C. 432, and they probably did not make use of it for a long time after that date, but the modern Jews employ this cycle.

Commander Caborne and Professor Orchard each strongly support the belief in the miraculous with special reference to the sun standing still, and I fully agree with them, as we are pointedly

told that "there was no day like that before it or after it, that the Lord hearkened unto the voice of a man" (Josh. x, 14 R.V.) These words leave no doubt on my mind that a miracle is recorded. The reference to the book of Jasher seems to me to indicate that the event was well known. Exactly what happened to the sun or to the earth, or whether the miracle was due to refraction, I cannot tell, nor, I maintain, can anyone do so, but we have the appearance and the practical result plainly described; we have seen how even a modern astronomer frequently describes only appearances, and he does not always go out of his way to state exactly what has happened.

I thank Dr. Heyward Smith for his correction about the name of the ancient Hebrews whom I had called Jews, and I have carried it out in the revision of the proof.

I am glad Canon Girdlestone draws attention to the fact that the sun and moon are described as the two lights in Gen. i, and that the stars are only mentioned incidentally. With our present knowledge of their magnitudes the few words devoted to them, "*he made* the stars also," Gen. i, 16, attain a tremendous climax in asserting the creative power of Jehovah.

The Canon raises an interesting question in connection with a ship entering the Red Sea from the south; but countries generally receive geographical names with reference to other lands which adjoin them; thus Somaliland means "the north land," and it has a long coast line facing the north. The fact that Yemen, "the south land," lies to the north of Somaliland, "the north land," is not an extraordinary state of affairs, as we have similar instances nearer home; for instance, Southend in Essex is to the north of the department of Nord in France.

In accordance with Professor Sayce's suggestion I have added a little to the short explanation about the precession of the equinoxes in the Appendix.

I am glad this subject has been found to be full of interest. I trust that more general attention and study may be directed to it in the future.